BOWEN UNIVERSITY IWO, OSUN STATE
COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE
STATISTICS PROGRAMME
B.Sc. DEGREE 2022/2023 SECOND SEMESTER EXAMINATION

COURSE CODE: STA 318 **COURSE TITLE:** Analysis of Variance
DATE: 20/06/2023 **TIME ALLOWED:** 2 Hours **CREDITS:** 2
INSTRUCTION: Answer questions ONE and ANY OTHER TWO.

Question 1

a. Write the ANOVA model for Unbalanced one-way classification. (5 marks)
b. Three special wo king ovens are used to heat metal specimens. All the ovens are supposed to operate at the same temperature. It is known that the temperature of an oven varies, and it is suspected that there are significant mean temperature differences between oven. The table below shows the temperature in degrees centigrade of each of the three ovens on a random sample of heating.

Oven	Observations					
1	494	497	481	496	487	456
2	489	494	479	478	475	480
3	489	483	481	472	472	477

i. Test for a difference between means of Oven Temperature at 5% Level of Significance
ii. Obtain the least square estimates for the variance in Ovens. $(22\frac{1}{2} marks)$

c. Write the ANOVA table for three factors A, B and C where A is nested in B is nested in C. $(2\frac{1}{2} marks)$

Question 2

a. Explain the concept when factor A is nested in factor B. $(7\ marks)$
b. Consider the following set of data arising from two factor study.

	FACTOR B			
FACTOR A	**1**	**2**	**3**	**4**
1	3.6	4.8	2.7	2.8
2	M	6.2	4.2	2.6
3	4.5	3.5	3.5	1.8
4	2.8	2.4	2.7	2.2
5	4.2	1.8	4.5	6,2

i. Obtain the value of m using the least square method.

ii. Obtain the desired ANOVA table. (7*marks*)

Question 3

Consider the data below:

	Types of Occupation		
Training Methods	**Office Worker**	**Manual Worker**	**Professional Worker**
A	33, 30, 27	25, 26, 26	35, 30, 24
B	27, 31, 33	28, 30, 32	32, 30, 28
C	33, 34, 28	33, 30, 29	30, 28, 31
D	26, 28, 34	24, 26, 28	35, 34, 33

a. Carry out an analysis of Variance and test at 5% level of significance for difference between the means for the two factors and its interaction effect. (18*marks*)

b. Obtain the least square estimates for the levels of factor B. (2*marks*)

Question 4

a. Write the ANOVA model for a three way classification. (7*marks*)

b. Consider the following set of data arising from a 3 factor study A, B, C in which the factors are fully crossed.

		FACTOR B							
		1		2		3		4	
	FACTOR C	1	2	1	2	1	2	1	2
FACTOR A	1	30 32	25 40	23 31	32 27	35 42	36 46	44 15	21 20
	2	15 22	32 41	44 10	31 17	31 15	30 42	30 46	30 30
	3	34 25	13 15	32 25	26 21	26 32	41 38	14 17	41 25

i. Clearly state the ANOVA model for collecting the data.

ii. Obtain the ANOVA table. (15marks)